3

The future of work in Latin America and the Caribbean

What are the most in-demand occupations and emerging skills in the region?

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The authors are grateful for the contributions of Gabriela Aguerrevere, Mikel A. Alcázar, Agustín Cáceres, and Laura Ripani as well as for the editing work of Irene Larraz, the graphic design of Jesús Rivero, the audiovisual team headed by Santi Capuz, and the valuable comments by Marcelo Cabrol.

Index

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1 | Introduction

If recent history serves as an example, the labor market will continue to undergo important and increasingly rapid changes in its demand for particular occupations and skills. Therefore, developing systems that can identify skills required in the market and providing tools for people to successfully navigate a changing work environment is necessary. New technologies provide us with new sources of information via access to big data. They can function as "radars" to detect, almost in real time, how the demand for skills is changing and pick up new skills as they emerge. These new technologies are also leading to the creation of tools that can support workers looking to change jobs.

This study sheds light on the changes that labor markets in Latin America and the Caribbean are undergoing in terms of their demand for particular occupations and skills. It also demonstrates the potential of a tool that, by leveraging new sources of labor market data, can help individuals and policy makers navigate the labor market and provide the region's workers with a means to detect skills that can help them move from declining occupations to emerging ones.

Technological changes are profoundly transforming the occupations and the required skills of labor markets around the world. Until now, there was little evidence about how these changes were taking place, their intensity, or their speed in Latin America and the Caribbean. In this third part of the series *The Future of Work in Latin America and the Caribbean*, we present new data about the evolution of occupations and the demand for skills in the region. These data are a combination of traditional and new large-scale data sources. Our analysis of these data shows that occupations related to the digital economy (such as computer science specialists) or services (such as food service professionals) are among the fastest growing occupations. The demand for advanced digital skills, like web and software development, knowledge of data storage technologies, or mobile application development is also increasing. On the other hand, employment is declining for managers and for repair and maintenance workers, and so is the demand for skills needed for these occupations, such as certain management skills.

These changes are associated with technological advancements, which reduce employment in occupations that are likely to be automated—that is, occupations that can be easily replaced by machines, such as machinery operators. However, unlike more advanced economies, the region does not seem to have a growing demand for workers with high education levels, perhaps because technology has not penetrated the region at the same rate. The wage polarization that some studies have pointed out in more advanced economies is not evident either. On the contrary, relative wages in occupations associated with knowledge (such as executives or managers) have risen at a lower rate than those of manual occupations, like caregiving or construction work. In fact, an increasing percentage of people with higher education cannot find work in their occupation and end up employed in different ones. This phenomenon highlights the importance of knowing which skills and occupations are emerging and in-demand.

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VIDEO

WHAT ARE THE SKILLS OF THE 21ST CENTURY?

2 | Why this?

The evolution of the labor market across the globe, due to accelerated technological changes and rapid population aging, requires adaptation of the knowledge, skills, and abilities of workers. Nowadays, deciding what to study is even more difficult than in the past. Many young people and workers wonder if the occupations they chose will still exist or if they will become obsolete, replaced by robots or algorithms. For those already in the labor market, these changes represent a threat of job loss, either as a result of automation or because they lack skills that will be required in the new occupations.

On the bright side, everything seems to indicate that—although some occupations have a good chance of disappearing due to automation (such as telemarketers)—the vast majority of occupations will prevail in one way or another[1]. It is very likely, however, that the tasks performed by people in such occupations will change a lot, as will the skills required to carry them out. In many areas, especially in the digital technology field, there is already a scarcity of people with relevant skills. Responding to these changes in demand is essential to creating new opportunities and minimizing the risks that technological development and population aging entail. Throughout history, the creation of new occupations and new tasks that only human beings could perform has allowed employment to remain constant despite increasing automation[2].

Adapting to these changes requires a paradigm shift of individuals, companies, education systems, and governments about the functioning of the labor markets. People and institutions must shift their paradigm because rapid technological change means many job-specific skills that are learned early in their careers lose their relevance quickly. Ongoing training is no longer merely desirable, but crucial to remaining relevant at work. As for companies, a large part of the talent they need today is not yet available in the market. This forces them to develop more training and more proactive strategies than in the past, transforming employers from mere human-capital consumers to direct producers. Training systems also face these technological and demographic challenges as they adapt to help people and companies develop relevant skills for the present and for the future while taking advantage of technology's opportunities. This means creating new programs, content, and learning methods that allow children and young people to acquire a solid base of interdisciplinary knowledge for various occupations, such as communication skills, creativity, teamwork, critical thinking, and learning skills. These skills are also known as **21st-century skills**. As the world changes, these programs will allow adults to continue acquiring relevant skills throughout life, complementing training with work. Finally, governments should look for new ways to promote and, in some cases, finance or co-finance these changes to ensure they are inclusive of all people.

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VIDEOS

THE EVOLUTION OF BANKING
HOW TO DISTINGUISH BETWEEN OCUPPATIONS?

AUDIO

IS THERE JOB POLARIZATION IN LATIN AMERICA AND THE CARIBBEAN?

3 | What's up?

Labor markets are changing with the incorporation of technological innovations. As new technologies are introduced into the production process, the tasks performed in a given occupation change. Two examples can be found in the banking sector and in the automotive industry. In the first case, the introduction of ATMs presaged the end of banking employees. However, this didn't happen. As more and more banks incorporated ATMs, bank employees took on new roles and tasks, going from handling payments or issuing money to managing clients' loans and investment portfolios. As for the automobile industry, production has been radically transformed. Instead of hundreds of people working on production lines to assemble mechanical parts, there are now robots that assemble highly complex vehicles while engineers and workers oversee the transnational value chain and the logistics to deliver vehicles to their final consumers. As a result, today's cars have more circuits and lines of code than the first vehicles sent into space; they are also produced in a fraction of the time and are relatively much cheaper. In the banking and automotive industries, people are still working and, in some countries, employment in these sectors is greater today than in the past[3].

The effects of technological change are not new. The evolution of the banking and automotive sectors reminds us that technological change has been unfolding since at least the first industrial revolution. Although there are growing concerns over introducing robots and artificial intelligence algorithms into the workplace, information technologies have already disrupted the labor market for several decades. Recent history offers many examples of how technology does, and always will, impact work.

These examples reveal that technology is more likely to replace humans in well-defined and repetitive tasks because these are more easily codified by a program or algorithm[4]. Workers who performed routine tasks such as issuing money, making payments, or assembling mechanical auto parts were most affected by the changes. This also occurred in other sectors. Overall, occupations that involve a high degree of repetition are more likely to be automated by some type of *software* or algorithm than occupations involving less-structured tasks.

As new technologies are introduced into the production process, the tasks carried out by people in a given occupation change

Most studies analyzing the impact of technology focus on whether employment is dropping in occupations with more easily automated tasks compared to other occupations. These studies evaluate jobs' level of possible automation, distinguishing between occupations with a large proportion of routine tasks (*easily automated occupations*) and those with more unpredictable tasks that cannot be codified (*less easily automated occupations*) (this distinction was proposed by Acemoglu and Autor, 2011[5]; Autor and Dorn, 2013[6]; and Autor et al., 2003[7]). They also distinguish between occupations in which workers mainly perform manual tasks (*manual occupations*) and those in which workers make intensive use of their reasoning skills (*knowledge occupations*).

The conclusion of studies focused on more developed regions, where more evidence is available, is strongly affirmative. **In all OECD countries, there is a greater loss of employment in more automatable occupations** (such as clerks or machinery operators). Among these occupations, those of a manual nature (such as operators and maintenance personnel) show the greatest drop in employment and in wages as a result of incorporating digitally-controlled machines and robots in the production chain. As for automatable knowledge occupations, a loss of employment (and purchasing power) can be seen among administrative staff and vendors as a result of incorporating computers, the Internet, and other information technologies.

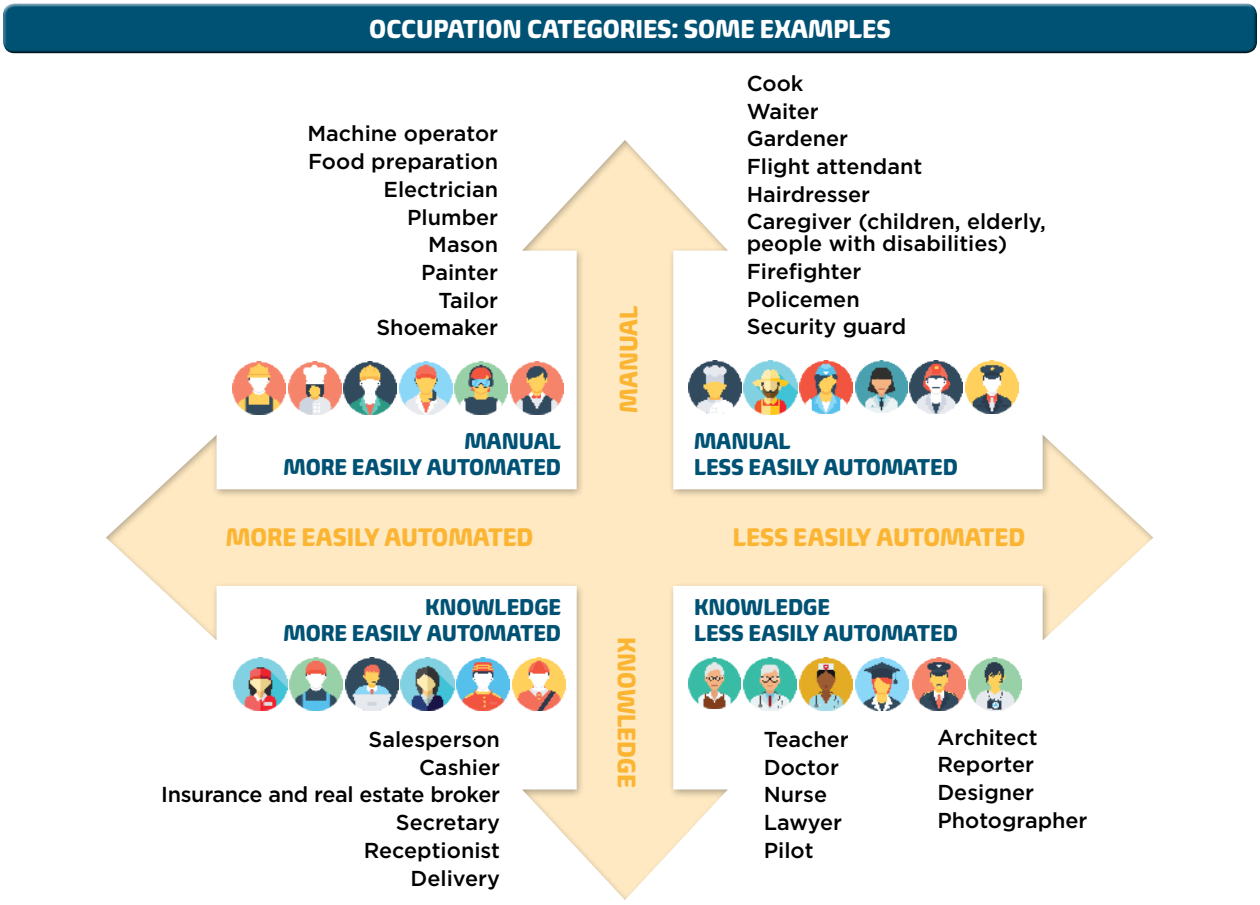
These movements across occupations are generating a phenomenon called *labor market polarization*, in which both the wages and the employment shares of occupations with the highest and lowest average salary increase, while both the wages and the employment share of medium average-salary occupations decrease.

Technology is better able to replace humans in well-defined and repetitive tasks.

Many of the displaced occupations pay salaries that are in the middle of the wage distribution, forcing many of these workers to take up other jobs. In the meantime, jobs with higher and lower wages grow. This is because the affected workers generally work in low-income jobs while new workers, who are more educated and can work with new technologies, obtain jobs with higher wages. This process, called labor polarization, generates greater economic inequality and is occurring in most developed countries, as shown in figure 1.

Is labor polarizing in Latin America and the Caribbean?

Labor polarization in Latin America and the Caribbean is only partially occurring. Although lower and higher wage occupations have increased, they have done so to a lesser degree (figure 1), and wage changes are not following the behavior seen in other regions. The employment rate of occupations with mid-level wages in Latin America and the Caribbean is dropping, and high- and low-wage jobs have grown. However, these changes have been of a lower magnitude than those observed in other regions.

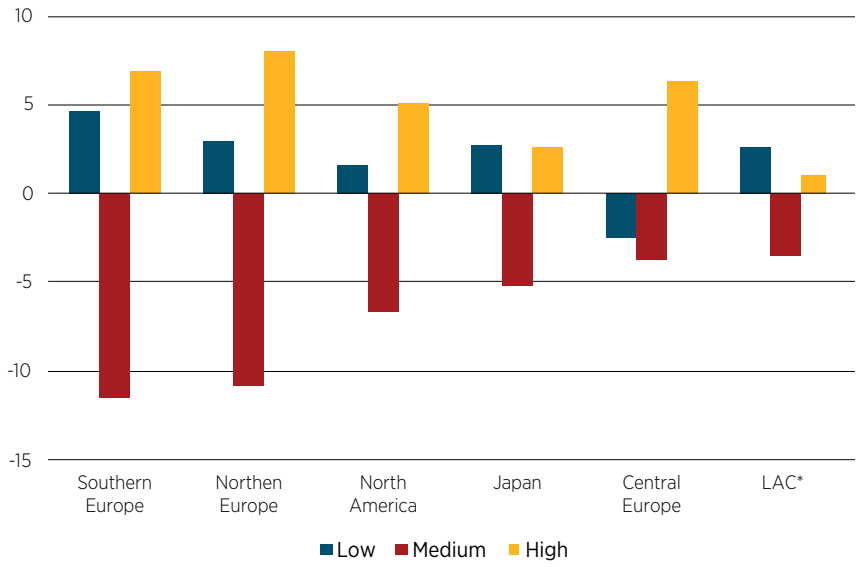


Partial polarization in LAC is also observed via the rearrangement of routine and knowledge occupations[i]**.** Figure 2 shows that cleaning personnel and financial specialists were the occupations that grew the most between 2000 and 2015. They are joined by salespeople, computer and math specialists, food preparers, health technicians, lawyers, pilots and air-traffic controllers, construction workers, and administrative personnel. On the other hand, the occupations that decreased the most during that period were managers, machinery operators, caregivers, machine maintenance and repair, drivers, physical science technicians, education specialists, biology technicians, artists, athletes, and security guards[ii]. Obtaining these insights at the regional level required extensive work to standardize the occupations based on household survey data from 9 countries in the region.

i The results presented here are based on the analysis of workers between the ages of 25 and 54, who are in their most productive years and have high and stable participation rates. This population was selected to avoid biases by excluding groups of workers who do not always participate in the labor force, either because they are still studying or because they have retired. For more information, see *Mostly Harmless Econometrics: An Empiricist's Companion* (Angrist & Pischke, 2009).

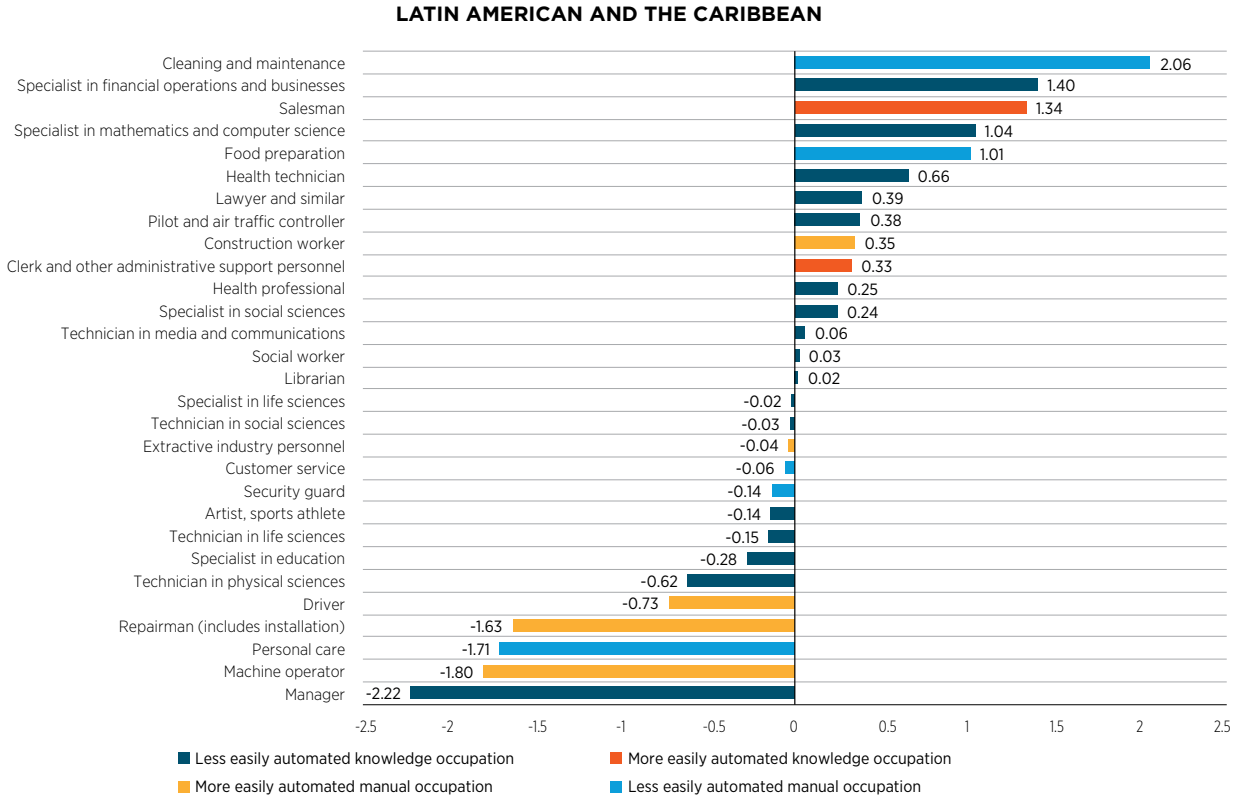
ii In the previous issue in the series *The future of work in Latin America and the Caribbean*, we highlight the growing participation rate of education professionals and caregivers in the region. The calculations in the current issue differ for two fundamental reasons; the first is that we define occupations differently. Second, the population of the analysis presented in this document only includes workers from urban areas between ages 25 and 54.

FIGURE 1. CHANGES IN EMPLOYMENT RATE ACCORDING TO WAGE LEVEL (HIGH, MEDIUM, AND LOW) (1995-2015)

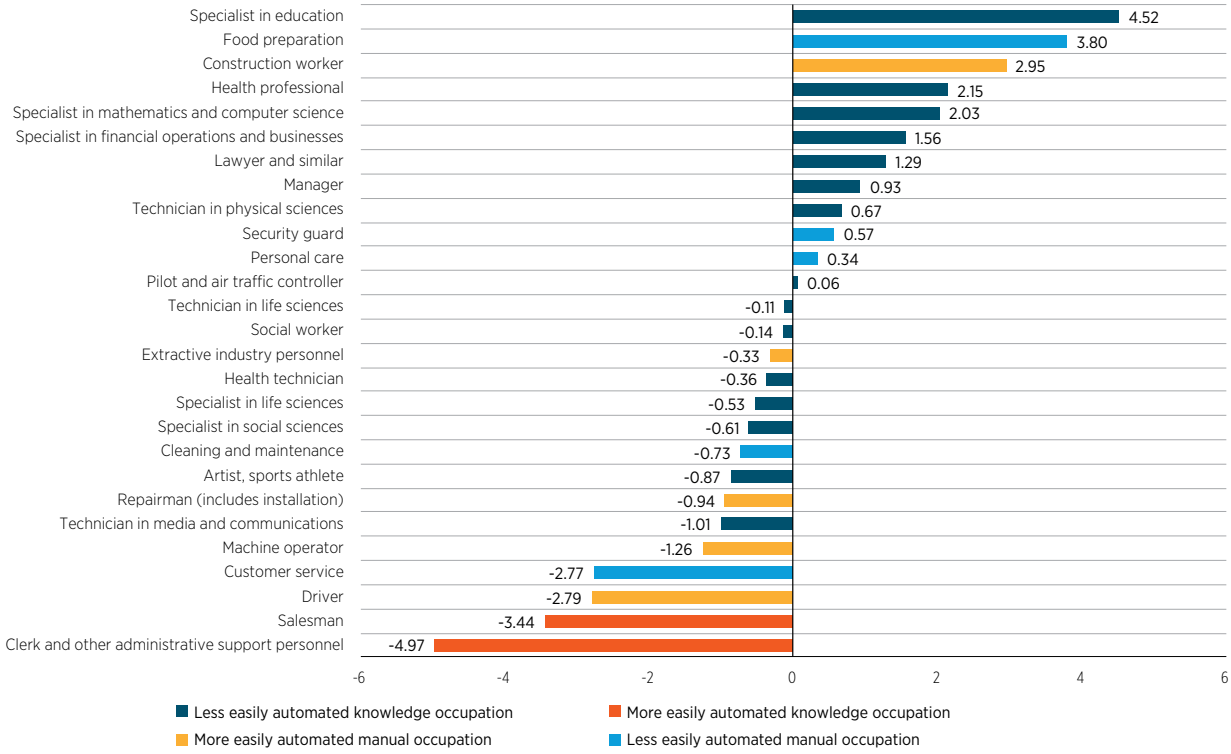


Source: OECD, 2017 and Labor Marking Information System for Latin America and the Caribbean (SIMS-BID). *For Latin America and the Caribbean, the same occupation classification as the OECD is applied, but the analysis period for the region is 2000-2015.

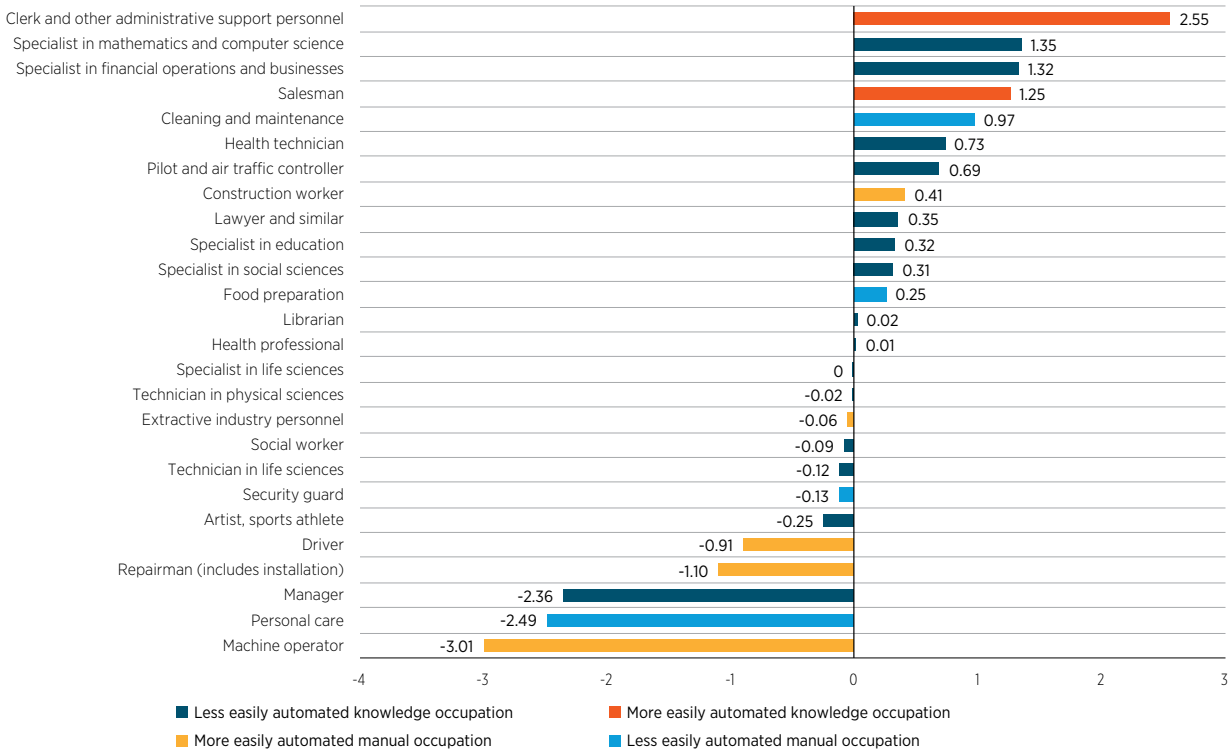
FIGURE 2. CHANGE OF THE SHARES OF WORKERS BY OCCUPATION BETWEEN 2000 AND 2015 (PERCENTAGE POINTS)



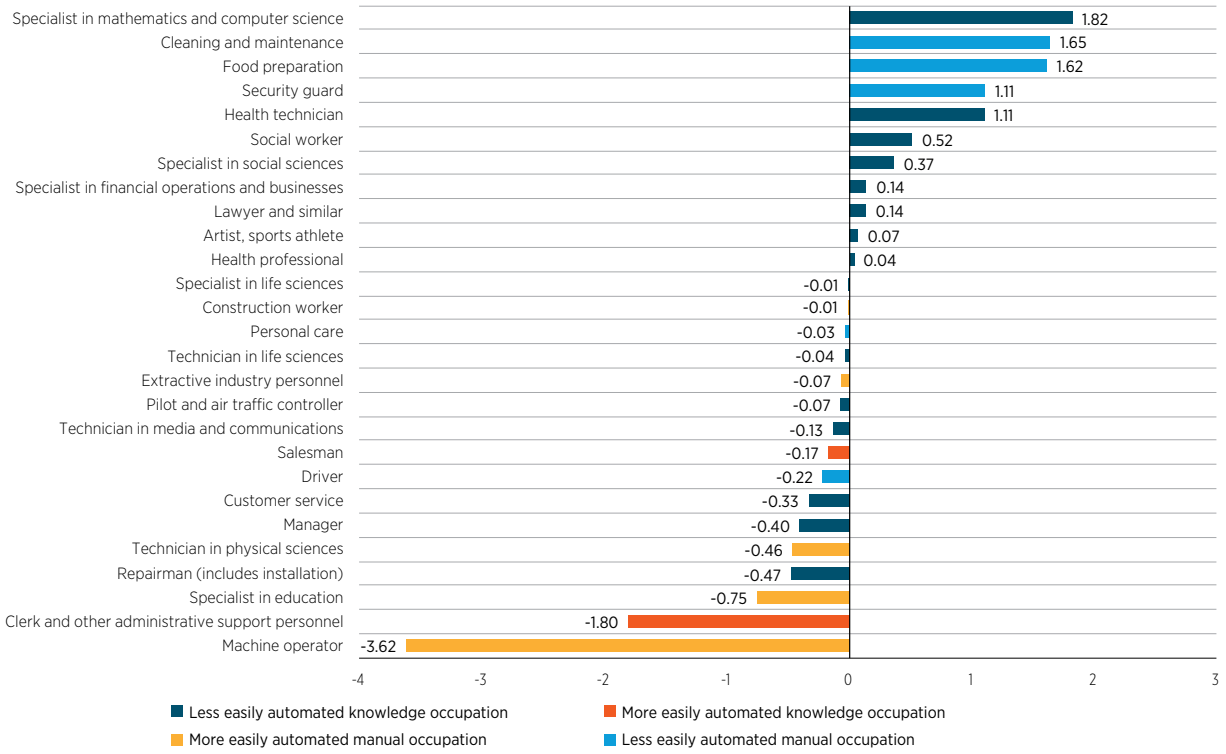
BOLIVIA



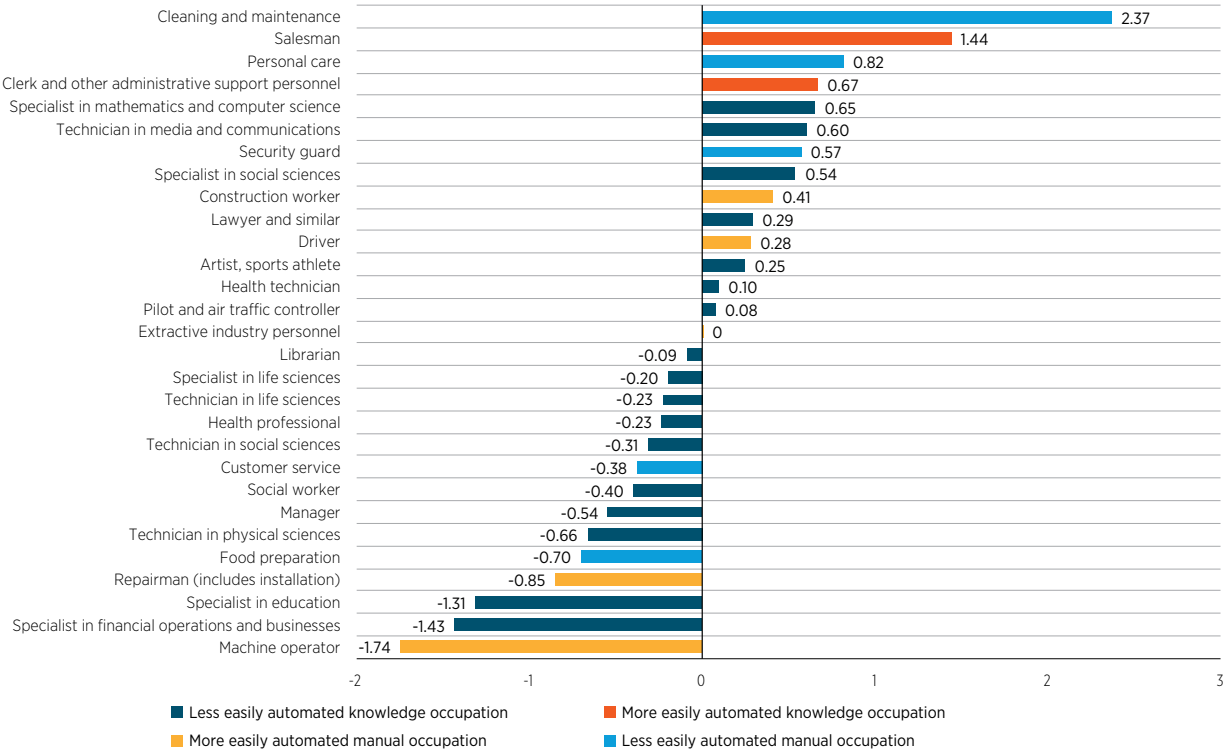
BRAZIL



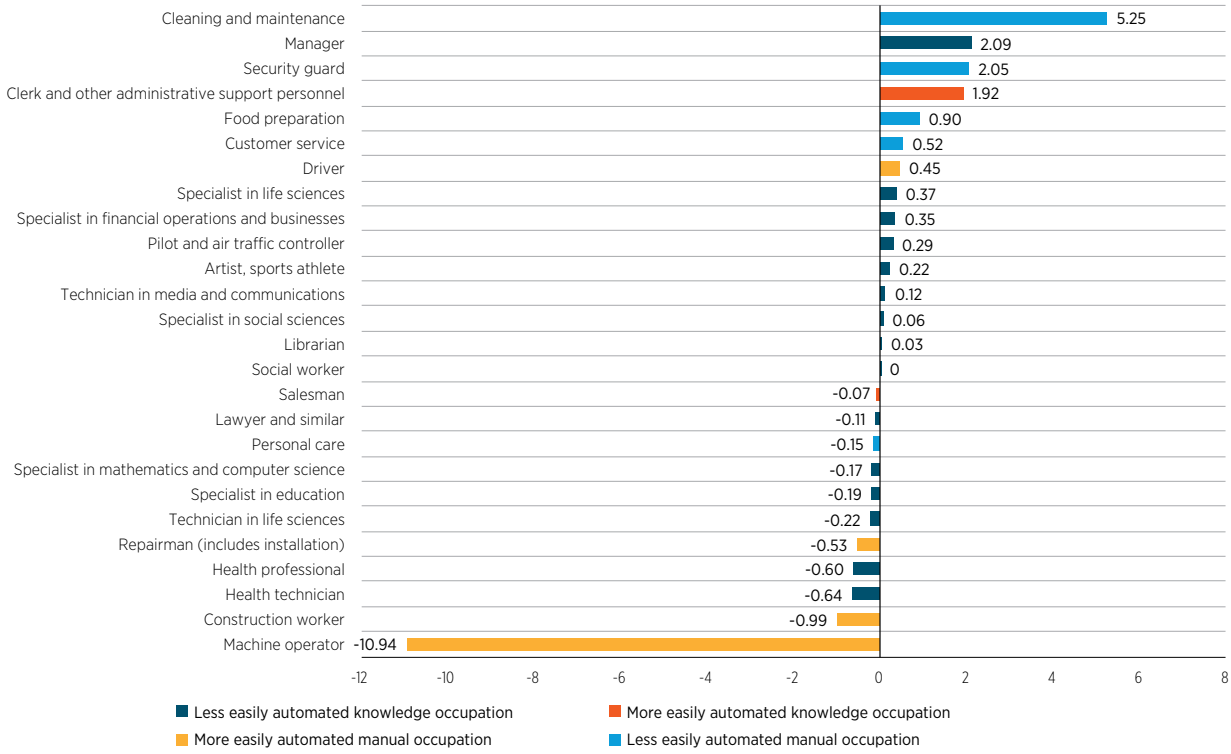
CHILE



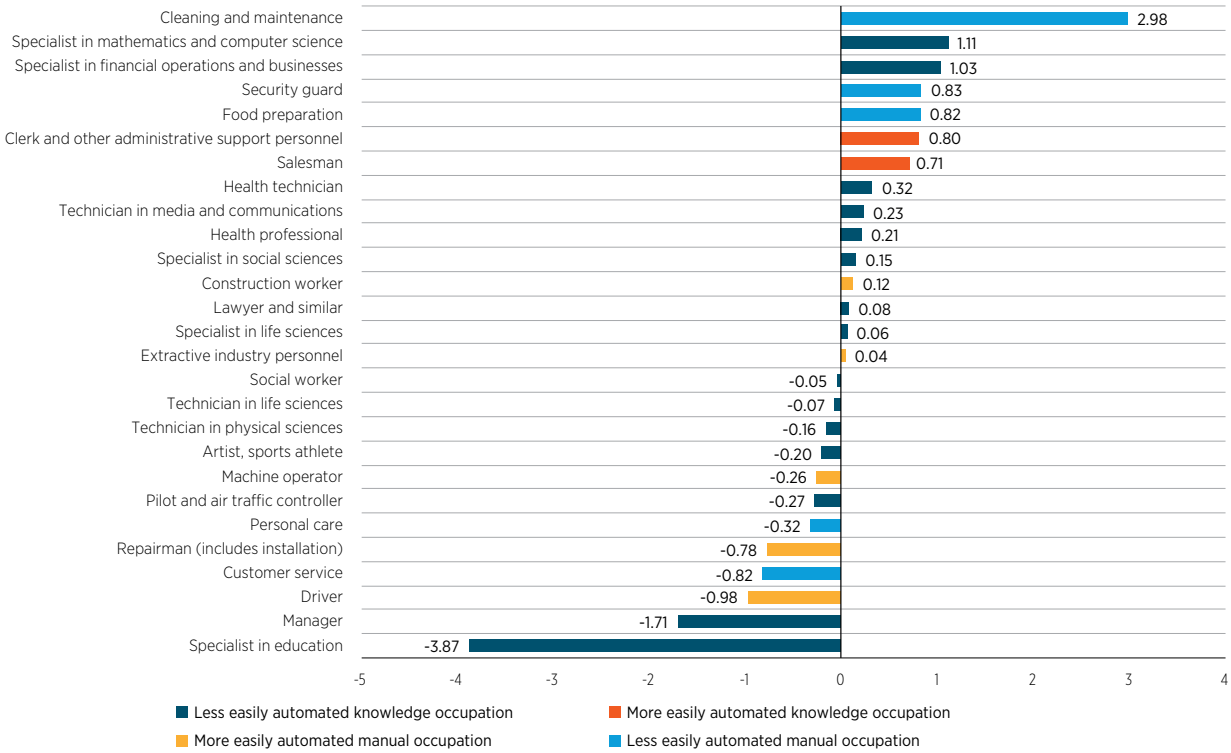
COSTA RICA



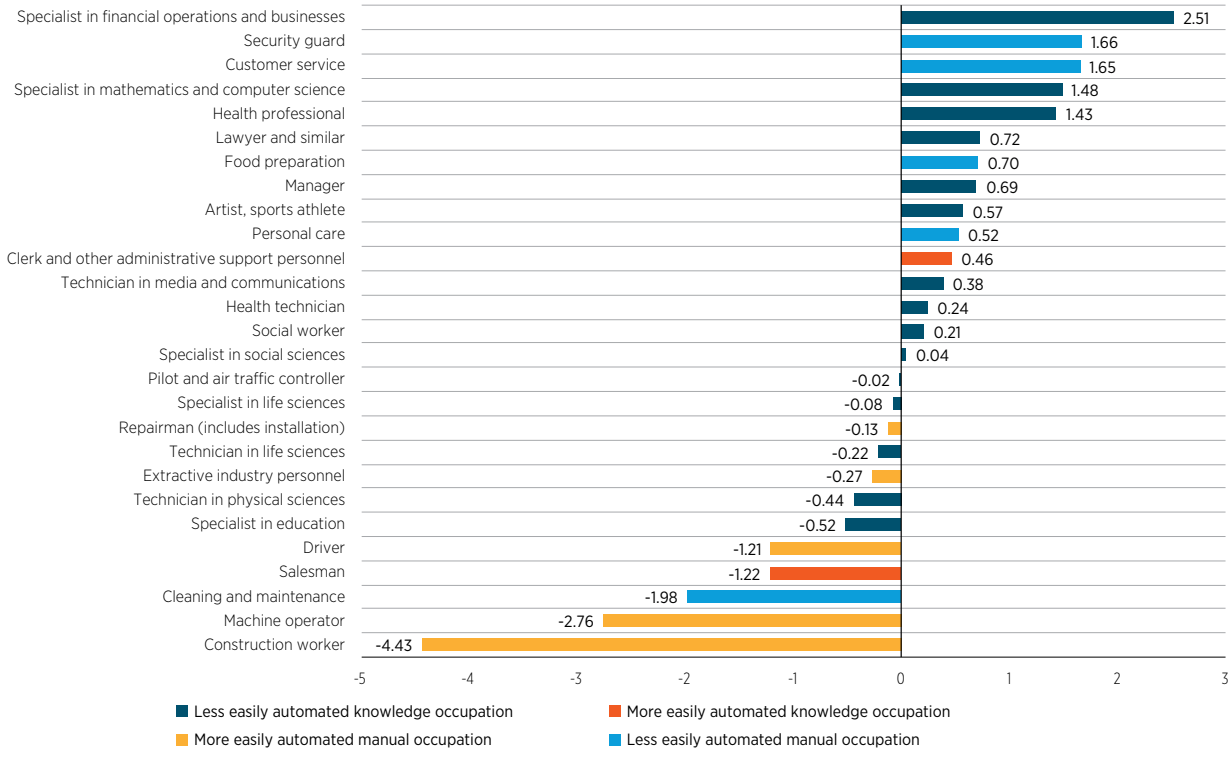
DOMINICAN REPUBLIC



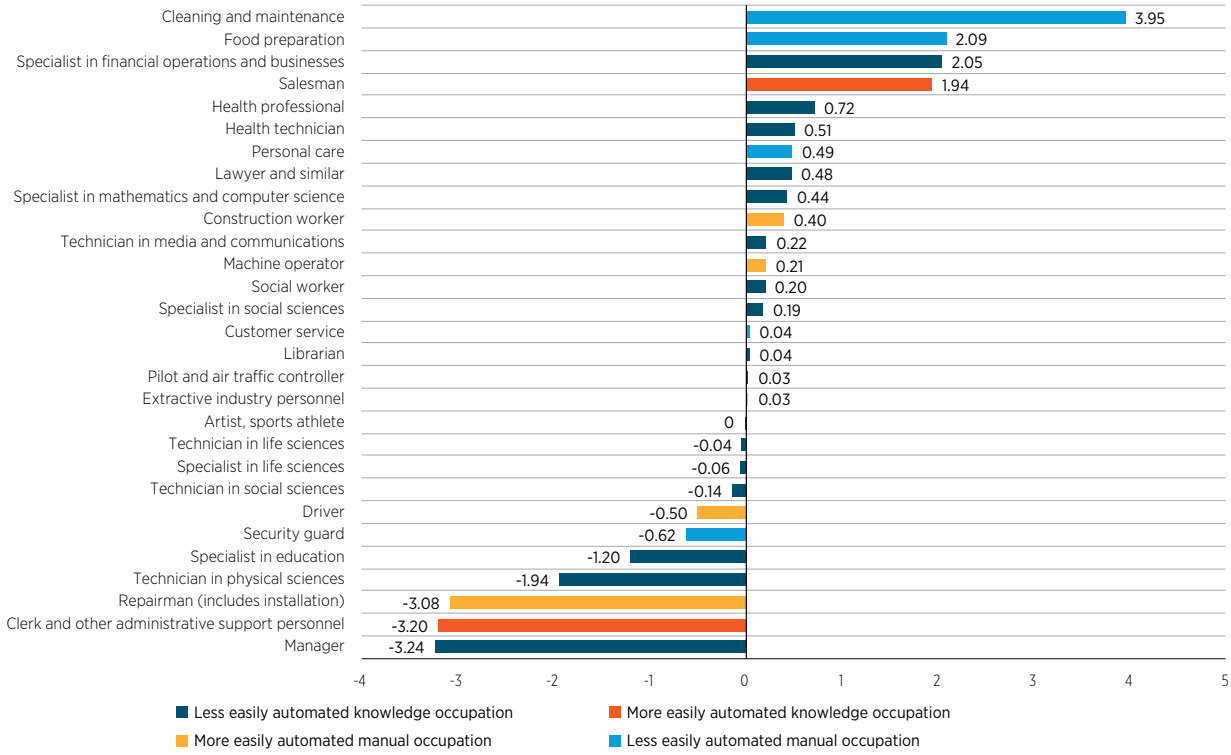
ECUADOR

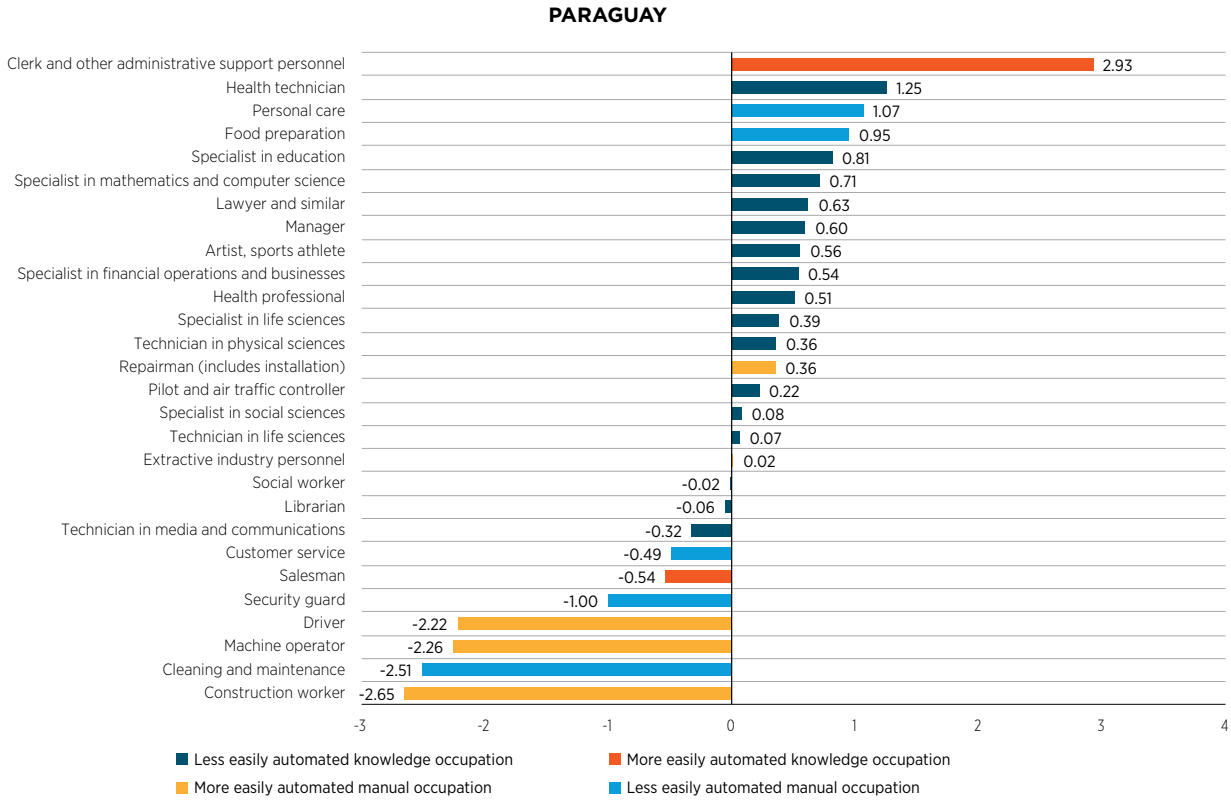


JAMAICA



MEXICO





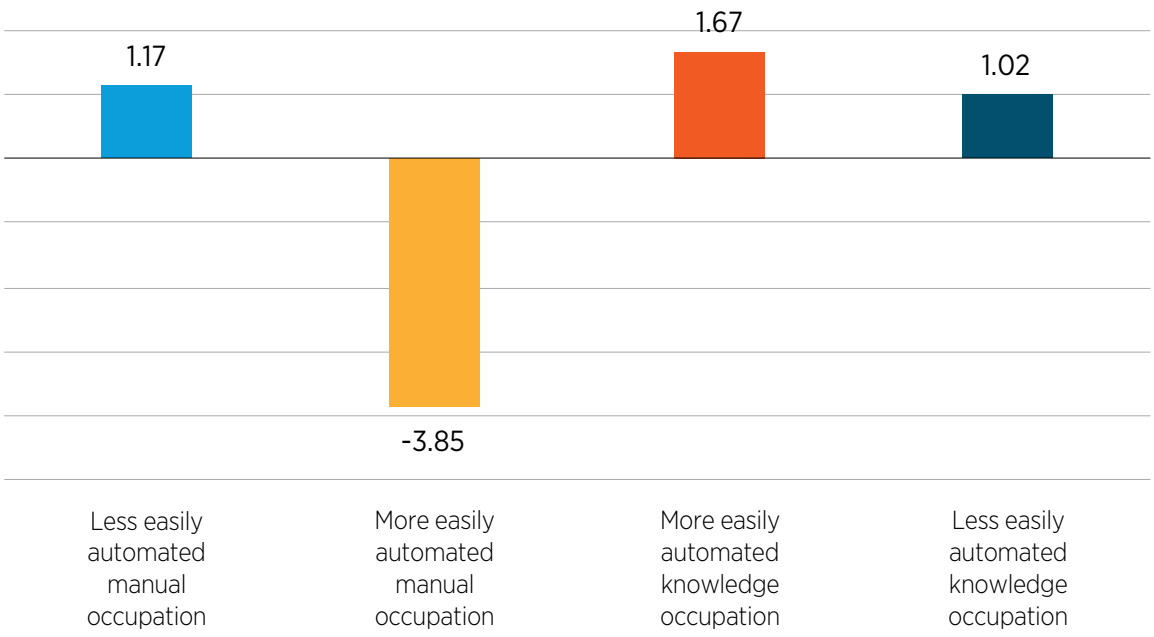
Source: Own calculations. See SIMS.

* The graph shows the change of the share of workers –percentage points– in each occupation between 2000 and 2015. The sum of all changes is equal to zero. The relative importance of the change for each occupation depends on the distribution of occupations in the base year (2000). For example, an increase of 1 percentage point in a given occupation could be the result of an increase from 2% to 3% or between 30% to 31%. Both changes represent the same number of workers, but each has a different importance for the corresponding occupation.

To what extent is this occupational shift due to technological change? Analysis of this occupational rearrangement (between occupations that are unlikely to be automated and those that are likely, and between manual and knowledge occupations) indicates that **highly automatable manual labor has dropped significantly in Latin America and the Caribbean** (figure 3). This phenomenon occurs in all the selected cases (figure 4) and in more developed economies with the same pronounced drop in this type of occupation (e.g., drivers or machinery operators). The progress of digitally controlled machines and, more recently, of multipurpose production robots has reduced the demand for these types of workers. On the flip side, non-automatable manual occupations that are usually found in the services area (cleaning staff, food preparation, and beauty professionals) have increased. This has occurred in all countries except Brazil and Paraguay.

One aspect that sets Latin America and the Caribbean apart from developed countries is that automation has not affected automatable knowledge occupations (such as administrative personnel). In most of the analyzed countries, these occupations increased their share of employment. One possible explanation is that in Latin America and the Caribbean, the penetration of information technology in knowledge occupations has not been as swift or as deep as in more developed countries, meaning that reduced employment might still be

FIGURE 3. CHANGES IN EMPLOYMENT RATE ACCORDING TO OCCUPATIONAL CATEGORIZATION (2000-2015)



Source: Own estimates using SIMS data.

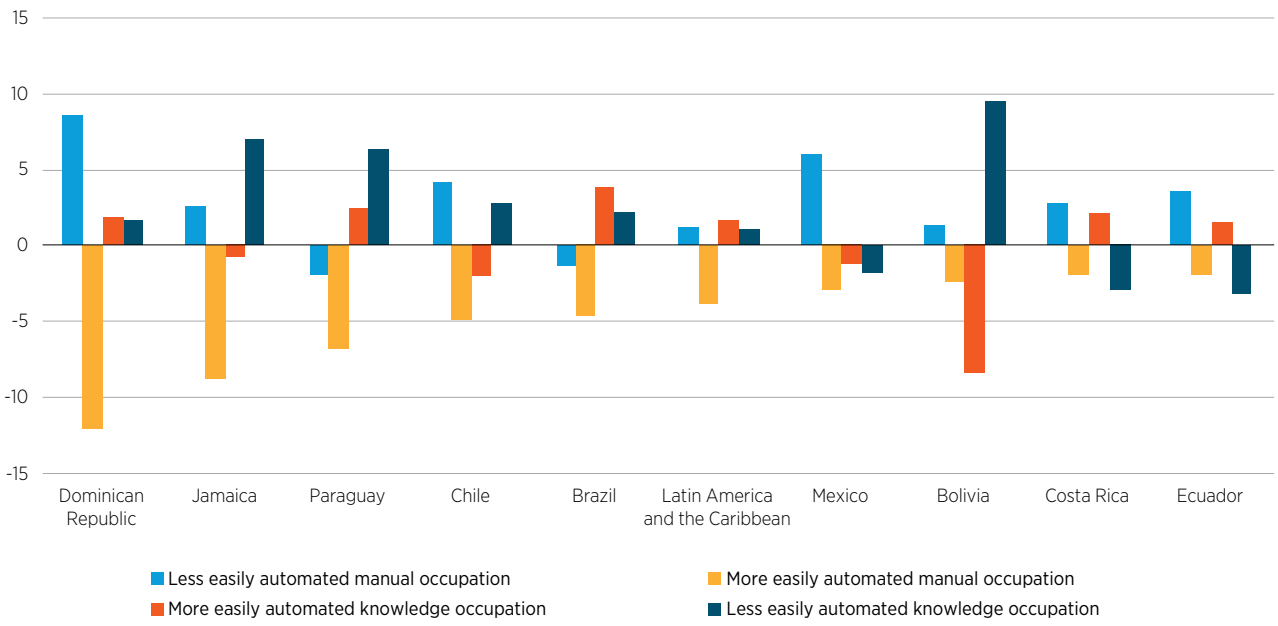
observed for these occupations in the near future. Exceptions can be found in Chile, Bolivia, Jamaica, and Mexico, where employment in automatable knowledge occupations has indeed fallen more than in other Latin American countries (figure 4).

Highly automatable manual work has suffered a significant decline in Latin America and the Caribbean

Another important difference in the region's occupational evolution compared to more advanced economies has to do with wages. **Unlike in developed countries, knowledge occupations have experienced lower wage gains than manual occupations**[iii]. During the period analyzed, which coincides with a significant increase in the prices of goods produced in the region, the wages of all occupations increased. However, those of manual occupations increased more than the average, while those of knowledge occupations increased less than the average, thereby reducing wage inequality between occupations.

iii When both the proportion of employment and wages increase, more workers enter an occupation and, at the same time, the economy generates more jobs of that type. On the contrary, when employment decreases together with wages, the occupation loses its relevance in the economy and fewer people are drawn to it.

FIGURE 4. CHANGES IN EMPLOYMENT RATE ACCORDING TO OCCUPATIONAL CATEGORIZATION (2000-2015)

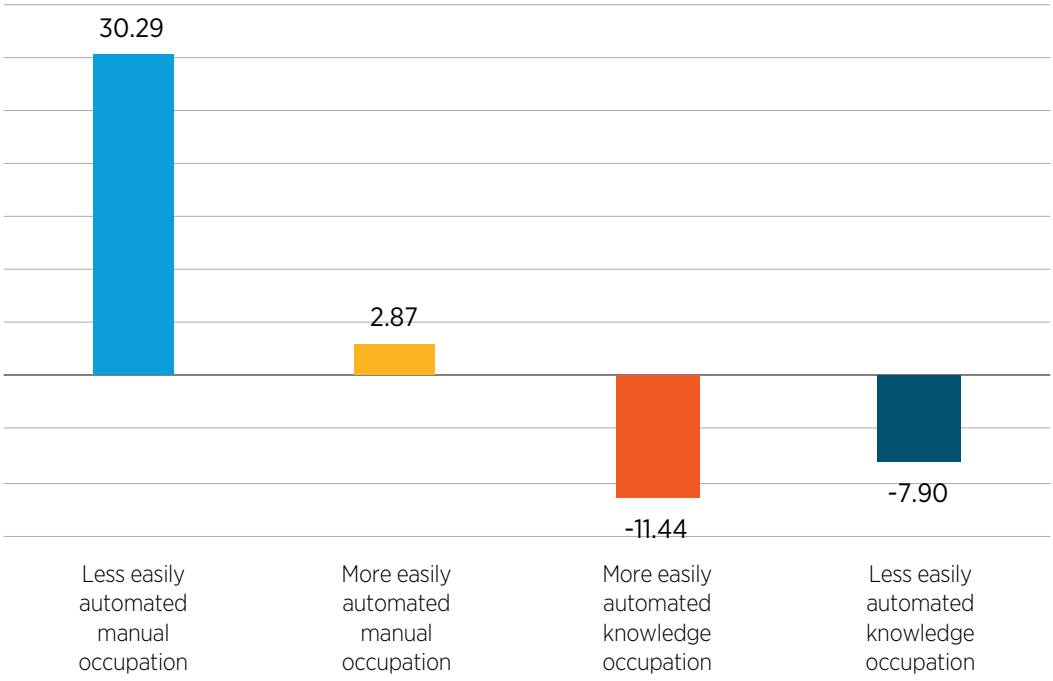


Source: Own estimates using SIMS data.

On the other hand, workers in more automatable occupations experienced lower wage increases. Among manual occupations, the most automatable ones had a very small increase, but less automatable occupations experienced an increase far above average. Furthermore, the knowledge occupations that are more automatable experienced lower wage increases relative to the average (figure 5). What do these dynamics mean? The changes reveal a lower demand for knowledge occupations compared to manual ones and a lower demand for workers in occupations that are likely to be replaced by technology.

The above results have similarities with previous studies on Latin America and the Caribbean. For example, two recent studies (Messina and Silva, 2018[8] ; and Fernández and Messina, 2018[9]), found a decrease in wage inequality and showed that it was mainly due to an increase in the salaries of low-income workers, a drop in the rate of return to education, and workers' lack of experience. Levy and López-Calva (2016)[10] also documented a drop in people returning to preparatory and university education for Mexico. Finally, Aedo and Walker (2012)[11] also recorded a drop in people return to education, both secondary and university, from 2002 to 2010.

FIGURE 5. CHANGES IN THE AVERAGE HOURLY WAGE RELATIVE TO THE COUNTRY AVERAGE (2000-2015)

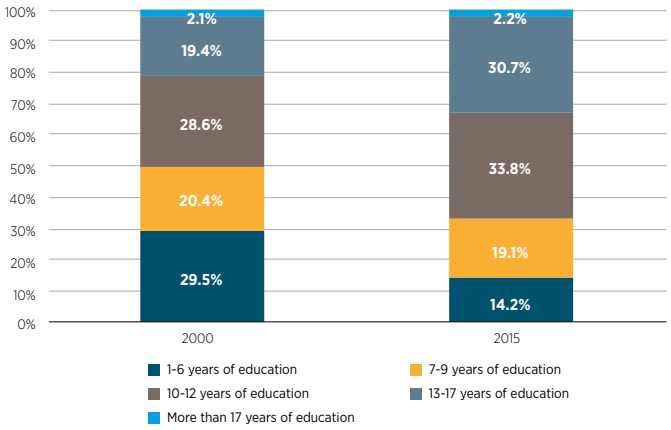


Source: Own estimates using SIMS data.

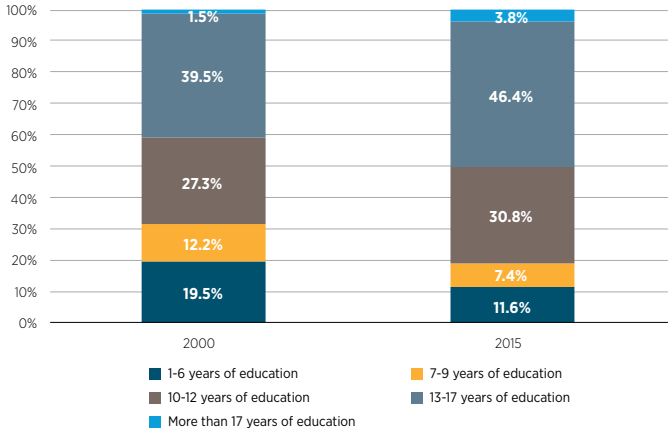
These changes took place during a period with an accelerated rise in the years of schooling among the labor force in Latin America and the Caribbean. Between 2000 and 2015, there was a significant increase in schooling among the region's working-age population[12]. The population group with the greatest growth was that of people with higher education (technical or university), which went from a fifth of the total workforce to almost a third. This is an extraordinary increase because the proportion of workers in this group increased by 50% in just 15 years (figure 6).

FIGURE 6. DISTRIBUTION OF YEARS OF EDUCATION AMONG THE LABOR FORCE (2000-2015)

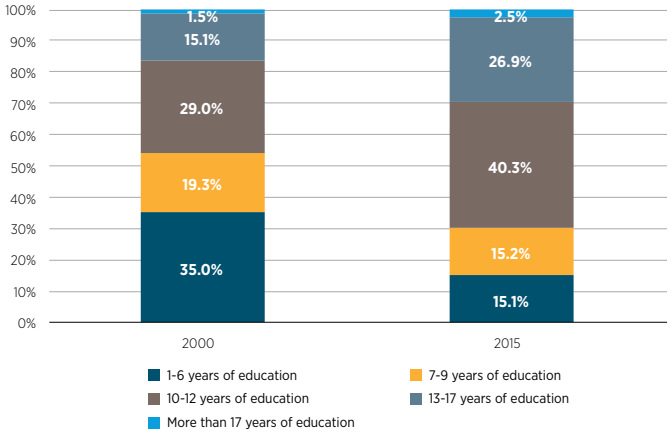
LATIN AMERICA AND THE CARIBBEAN



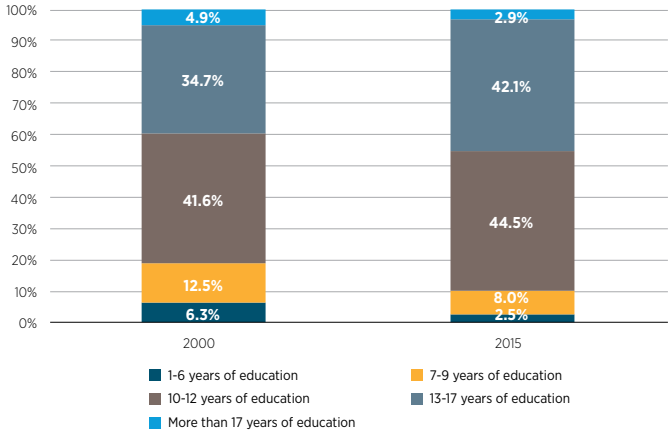
BOLIVIA



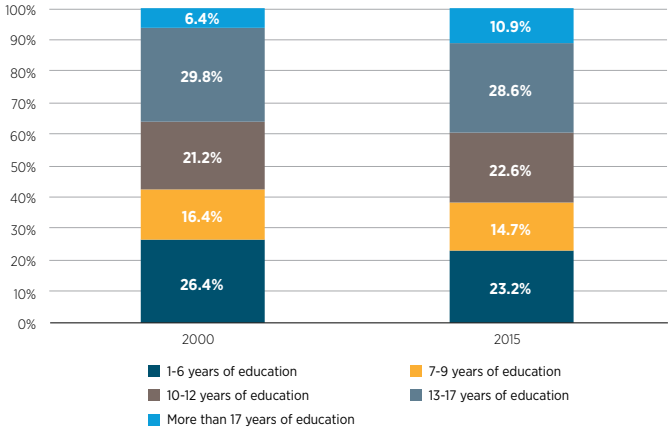
BRAZIL



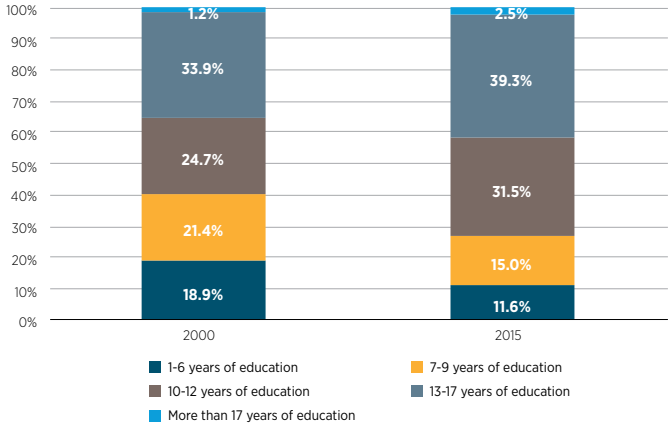
CHILE

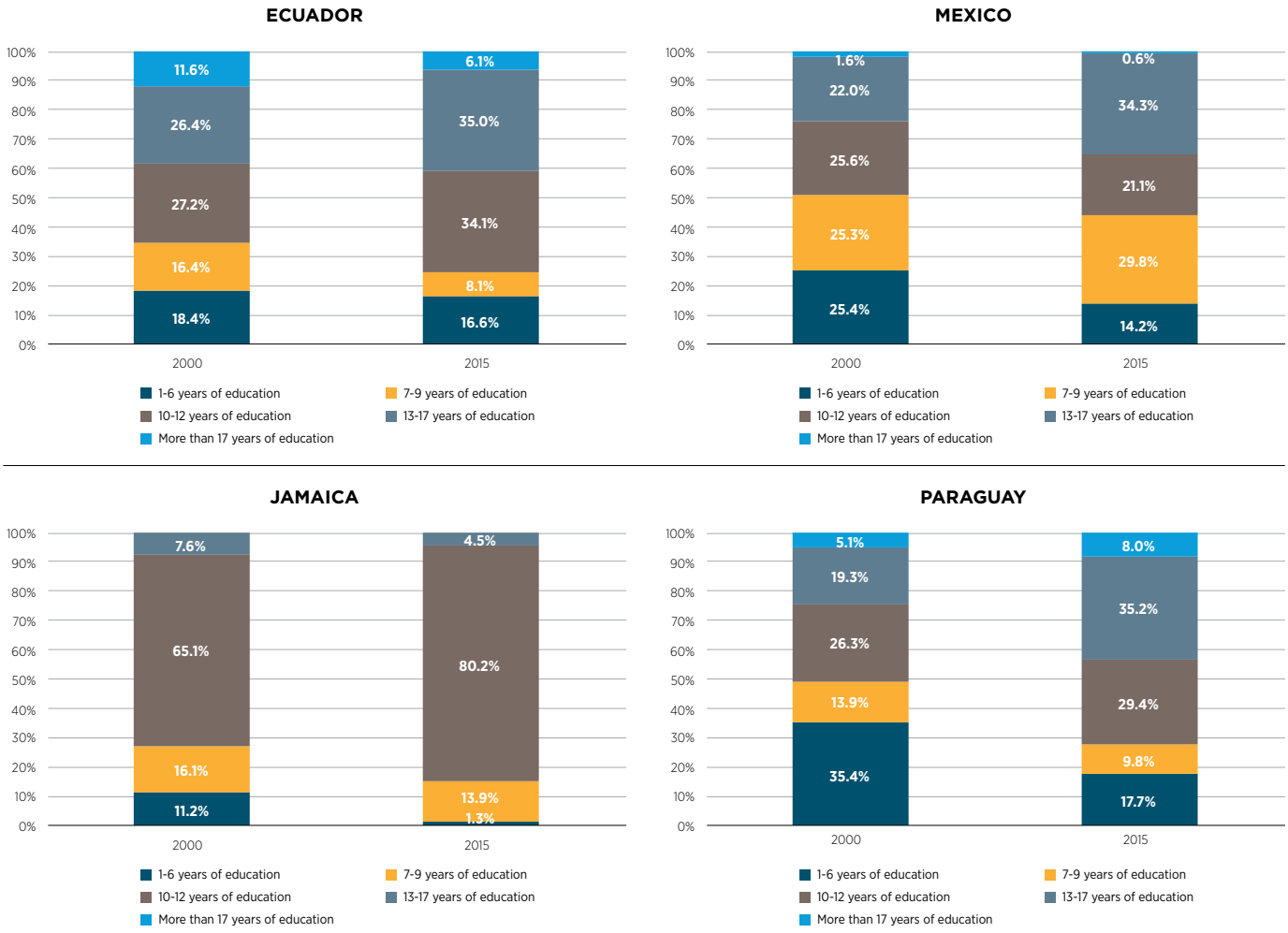


COSTA RICA



DOMINICAN REPUBLIC

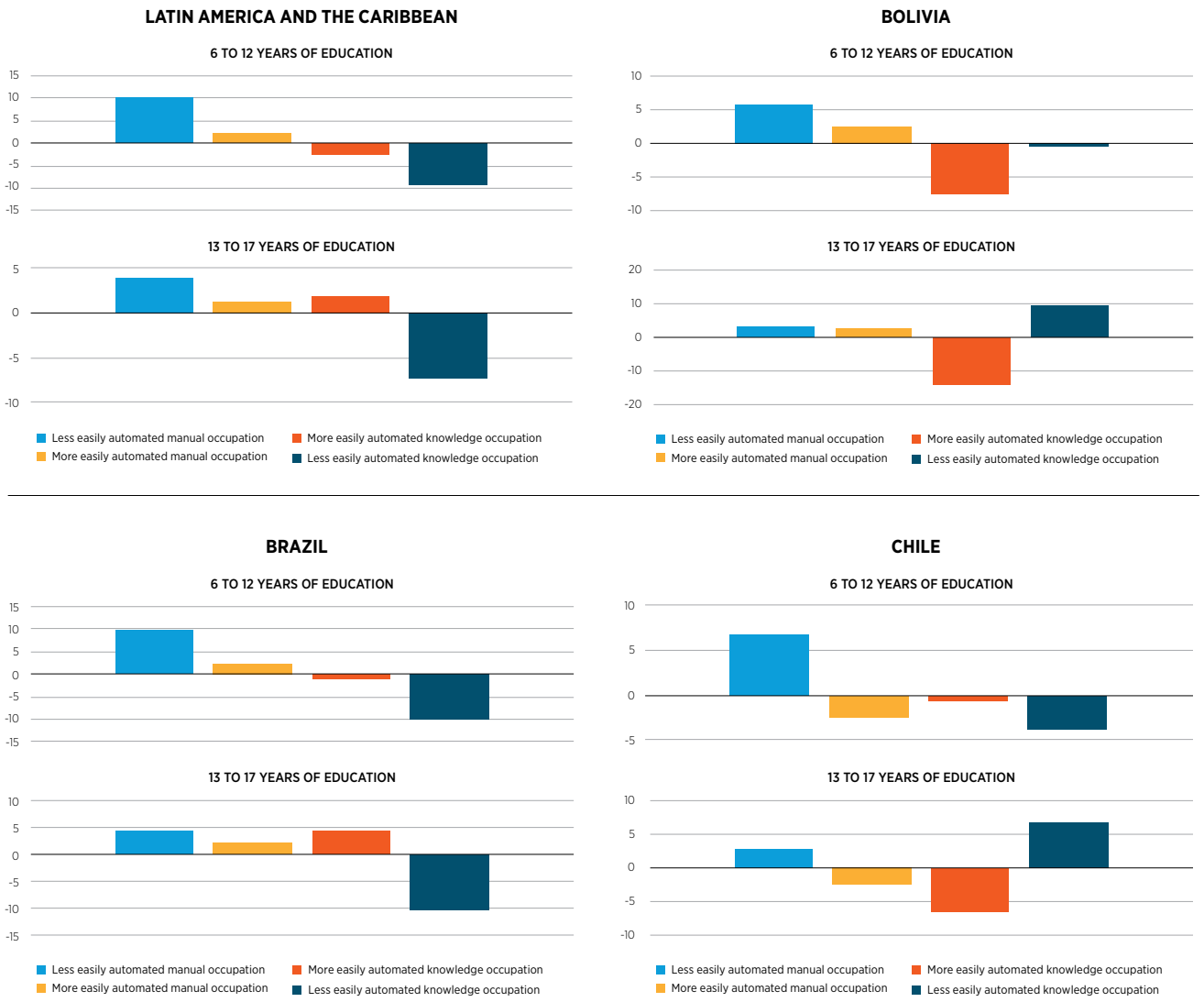




Source: Own estimates using SIMS data.

However, as workers with higher education were incorporated into the labor force, competition increased and, as a result, the options for professional jobs seem to have decreased. The increase in the population with the highest educational level has not been accompanied by a sufficient increase in knowledge jobs. Therefore, many of these new university students are employed in manual work. In fact, the slimmer chances of working as professionals and the greater probability of being employed in manual occupations has been even more pronounced among the population with a secondary education, revealing increased competition for jobs in knowledge-related areas (figure 7).

FIGURE 7. CHANGES IN OCCUPATIONS BY YEARS OF EDUCATION (2000-2015)



Source: Own estimates using SIMS data.

In summary, jobs have decreased in highly automatable manual occupations (such as machine operators or equipment repair personnel) while the demand and the wages for low-skill service sectors has risen (such as cleaning staff or food preparation). Some of the highest-paid professionals, such as finance specialists or computer technicians, have increased their participation rate. However, the labor market for the most qualified people has not been dynamic enough to absorb the huge wave of highly educated professionals who joined the labor force from 2000 to 2015. This contrasts with more developed countries, where the incorporation of new technologies has boosted the demand for and the wages of professionals with higher levels of educational.

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AUDIOS

THE NEW SOURCES OF DATA IN THE LABOR MARKET
WHAT IS THE LABOR MARKET GPS?

4 | What's new?

The previous discussion belongs to the recent past and to the context of the third industrial revolution, which is characterized by the advent of computing. Artificial intelligence and robotics are gaining ground as we enter the fourth industrial revolution, so more tasks and more occupations will become automatable, and jobs in those areas will likely be lost. An example of how new technologies continue to conquer new ground involves vehicle driving, as mentioned previously. In 2004, studies concluded that it was impossible to automate drivers' main task of driving. However, only five years later the first autonomous automobiles began to circulate in the United States[13]. Experts believe that in less than 10 years manufacturing this type of vehicle will become profitable and will lead to their large-scale deployment as commercial vehicles[14]. As a result, this occupation has quickly gone from non-automatable to being among the most likely to be automated[15]. This is cause for concern because Latin America and the Caribbean has close to five million drivers, making up almost 6% of the workforce.

As we head into the 4th industrial revolution, high-skill employment may be more affected. As discussed in earlier sections, the introduction of computing in developed countries favored the most-qualified and highest-paid workers. In these countries, people worked hand in hand with technology and were empowered by it, gaining in productivity and remuneration. This did not occur, or did so to a lesser extent, in Latin America and the Caribbean for reasons that are still unclear. In the fourth industrial revolution, artificial intelligence increases the chance for lower-skilled workers and highly skilled workers to be replaced in a growing set of occupations. Indeed, today we have artificial intelligence algorithms that can generate medical diagnoses, make investment decisions, or examine legal backgrounds with greater precision and speed than humans. All this adds to the uncertainty and anxiety regarding people's relevance in future labor markets.

If history serves as an example, technology's resultant destruction of jobs will be accompanied by the creation of new ones in existing occupations and in other occupations that are still hard to imagine. Throughout history, new technologies have created wealth, which in turn has generated a greater demand for goods and services. This has resulted in job growth, particularly in occupations that are not easily automatable, as is the case with many services. Technology has also been a source for new jobs. Not more than 15 years ago, there were no drone pilots, social network managers, or big data experts, but they are now rapidly growing occupations.

Technology enables the emergence of new sources of information, such as professional networks or job portals

Even without a crystal ball to see the jobs of the future, new technologies (such as professional networks or job search portals) lead to new sources of information. **These new sources can help us understand which skills different occupations require, how these requirements are changing, and how people can transfer from one occupation to another, based on these skills—a sort of employment GPS.** This information can be used as a guide to help people relocate within the labor market. Let's take, for example, the case of an accountant in Argentina who would like to know which occupations she could transfer to with her existing skill set. She has lost her job and has few prospects of finding a new one in this declining occupation. How difficult will transferring to a new occupation be for her? Such information also allows us to build tools that provide more accurate information to guide companies, training institutions, and states in their decisions regarding employment and possible transitions.

BOX 1: HOW REPRESENTATIVE IS LINKEDIN DATA?

LinkedIn is one of several nontraditional data sources that can help explain trends for occupations and for relevant skills. LinkedIn provides accurate data on a subset of the labor market encompassing certain economic sectors and knowledge occupations (both highly automatable and not) that require higher education. This is because LinkedIn users in Latin America and the Caribbean are, in general, more educated than average, with most having a partial or completed tertiary education.

Comparing the number of members in this professional network with the 15 to 64 year-old labor force in 18 Latin American countries and the Caribbean (for which we have data in the SIMS) allows us to estimate that LinkedIn members represent 20% of the 2017 labor force in the region. In recent years, LinkedIn membership has significantly increased in the region, reaching more than 86 million profiles to date. In another comparison with data from the International Labor Organization, one study found that the average age difference between LinkedIn data and ILO data is five years, with that of LinkedIn being older[17]. Also, the fraction of registered women in this social network is only slightly greater than that of the ILO database. Throughout the world, the most represented sectors on LinkedIn are: information and communication technologies (48%); occupational, scientific and technical activities (26%); mining (25%); insurance and finance activities (22%); art, entertainment and recreation (14%); and the manufacturing industry (3%). In Latin America and the Caribbean, the most-represented industries are information and communication, followed by mining. Although information for other economic sectors exists, the sample size does not allow a comparison of their representativeness.

What do new data tell us about emerging skills?

There is hardly any evidence from the region on how the demand for skills is changing. Despite new studies published on emerging skills in other countries' labor markets, there is very little evidence from Latin America and the Caribbean on how these changes are unfolding[16].

Analyzing these new sources of information can make it possible to determine what skills are associated with each occupational profile and how changes in occupational trends affect the demand for certain skills. Based on anonymized data from LinkedIn profiles, we identified some important trends in the demand for skills in four countries in the region: Argentina, Brazil, Chile, and Mexico. These data do not represent all workers, but rather a subset of people who created profiles in this social network. It therefore more accurately represents the most highly educated segments of the labor market (box 1)[iv].

Findings

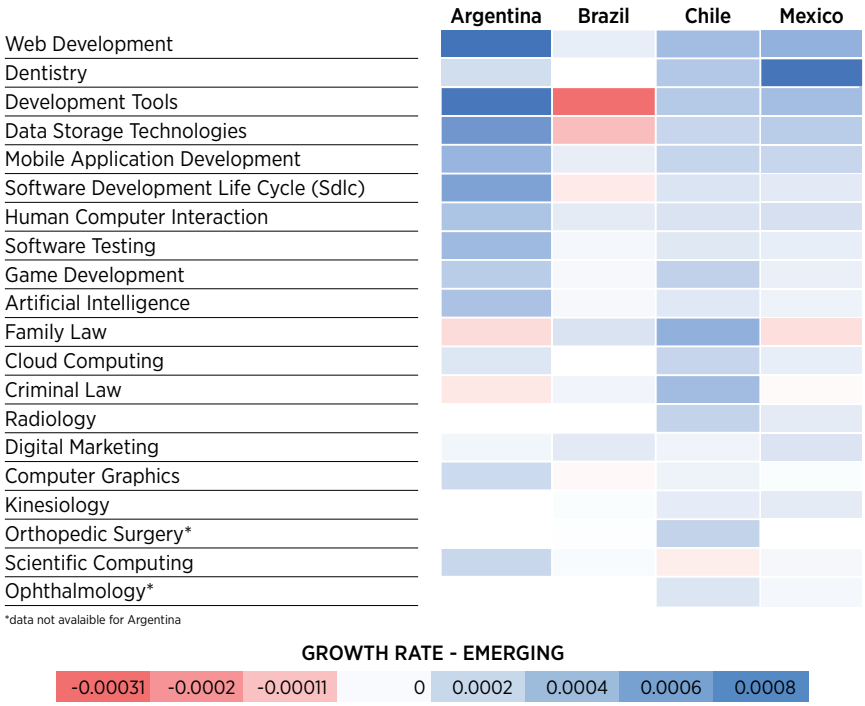
The demand for advanced digital skills increased as a result of expanding occupations in the digital economy. Out of the 20 skills that increased the most on average among the four countries, 10 are directly tied to technological development. In order of importance, they are: knowledge of web and *software* development tools, knowledge of data storage technologies, mobile application development, systems development life cycle, human-computer interaction, *software* testing, artificial intelligence, cloud computing, and scientific computing (figure 8). It should be mentioned that the increased demand for digital skills in Brazil seems to be smaller than in the other three countries.

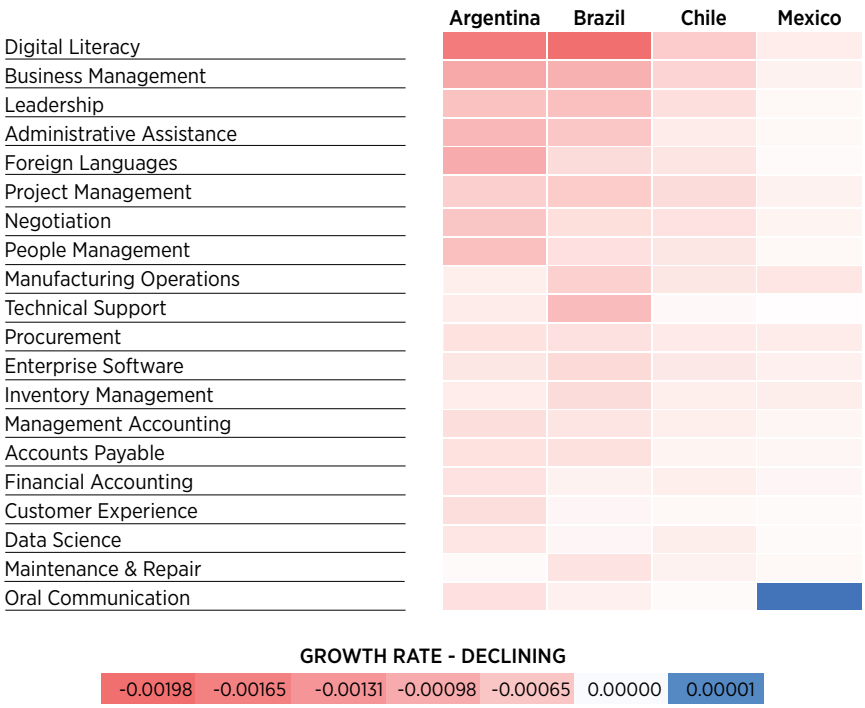
Hence, there is high growth in the demand for creative digital skills such as game development and animation, digital marketing, and computer graphics. This growth is smaller in Brazil than in the other three countries. Lastly, demand has also increased in certain branches of law such as family or criminal law, especially in Brazil and Chile. Demand has also increased for certain skills related to medical occupations such as dentistry, radiology, kinesiology, orthopedic surgery, and ophthalmology, again except for Brazil.

These same data sources give us insight into which skills are in decline as a result of occupational changes. Such is the case for basic digital skills. This drop is due to slow growth among many administrative occupations, such as administrative support or accounting, that traditionally required basic digital skills. Occupational changes and, especially, the decreasing demand for managers and administrative personnel also entails a significant decline in management skills of leadership, negotiation, and personnel management.

iv Skills are measured using the information provided by the users in their profiles, either in the skills section or in other parts of the profile that refer to the tasks a person can perform, for example "I code in Java". Changes in the demand for skills are detected based on the required skills in occupations with increased new hiring, as a percentage of the total number of new hires during the analyzed period. This analysis provides information about the changing demand for skills as a result of occupational change. For more information, see *How far can your skills take you?* (Amaral et al., 2018).

FIGURE 8. EMERGING AND DECLINING SKILLS (2015-2017)





Source: *How far can your skills take you?* (Amaral et al., 2018). The figure shows the most in-demand and declining skills, sorted by their average increase in the four Latin American countries analyzed (Argentina, Brazil, Chile and Mexico). It corresponds to changes in the demand for skills as a result of change in occupations.

A third group of declining skills in LinkedIn for these four countries are those associated with administrative occupations. In decreasing order of decline, we find that skills associated with administrative support, project management, purchasing, payments, and financial accounting are in less demand.

Finally, the drop in demand for skills related to the production of goods and services, such as operation management, machinery maintenance and repair, and inventory management is worth noting.

Data obtained from other job portals (such as CompuTrabajo or Bumeran) can also provide relevant information on the skills in demand and how the labor market is evolving. There is an increasing number of studies that use these data to study the demand for different occupations and skills[v]. A recent study in Recife, Brazil used such information to identify the skill requirements of industry 4.0.[18] The results enabled the Brazilian Association of Technology and Communication Companies (Brasscom) to identify which technical skills are currently needed by 4.0 industries in Recife, like systems maintenance and support, *hardware* and *software* development, and IT security. Notably, companies in this industry require skills that are not only related to technology. The analysis determined that soft skills, such as problem-solving and teamwork, are valued even in these types of occupations.

Transferability: Different occupations, similar skills

New sources of information can also support transitioning workers. Users' profile data from LinkedIn can allow us to build tools that help workers or policy makers answer key questions, such as:

- If I want to change occupations, which are most similar to mine? Which ones are currently growing?
- To transition between the two, which skills am I missing? And which skills are the most sought-after in my geographic area?
- Considering my skill set, which in-demand occupations could I move toward?

A demonstration tool is available here (see interactive tool).

The above example shows the potential of new information sources to answer public policy questions and to build tools that use this information for decision making. Moreover, as we expand massive data —i.e., quantity, type of information, improving quality, and complementing and merging this information with traditional data— the greater its potential and scope of application will be. This will provide more effective and more efficient guidance for people, companies, and training providers.

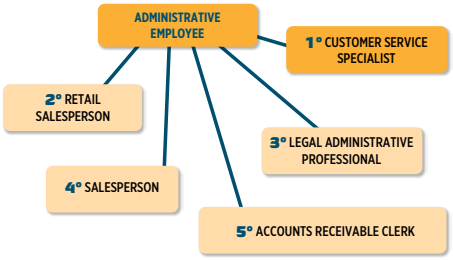
v A good example is the publication *The top 10 skills employers look for in job applicants* (Nesta, 2017).

WHAT IS THE LABOR MARKET GPS?

ARGENTINA

ADMINISTRATIVE EMPLOYEE

CLOSEST OCCUPATIONS



SKILLS NEEDED

TO TRANSITION FROM ADMINISTRATIVE EMPLOYEE TO CUSTOMER SERVICE SPECIALIST

Freight Forwarding	67
International Sales	16
Customs Regulations	15
Project Management Office (Pmo)	11
Service Delivery	7
Pre-Sales	5
Data Center	4
Unix	3
Servers	2
Cisco Systems Products	1

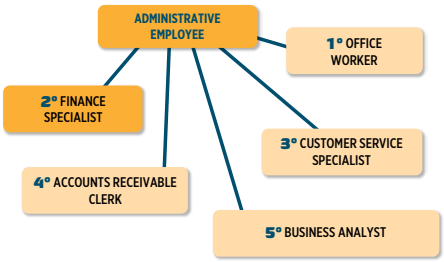
SHARED SKILLS

	ADMINISTRATIVE EMPLOYEE	CUSTOMER SERVICE SPECIALIST
Customer Retention	26	91
Customer Experience	7	73
Shipping	10	53
Organization Skills	72	51
Salesforce.Com	6	30
Sales Operations	6	28
Cold Calling	14	24
Contact Centers	5	24
Interpersonal Relationships	26	21
Freight	3	21

BRAZIL

ADMINISTRATIVE EMPLOYEE

CLOSEST OCCUPATIONS



SKILLS NEEDED

TO TRANSITION FROM ADMINISTRATIVE EMPLOYEE TO FINANCE SPECIALIST

Middle Office	262
Tax Reporting	262
Synchro	262
Infrared (Ir)	201
Payroll Processing	71
Iss	44
Bonds	32
General Ledger	27
Icms	26
Variance Analysis	25

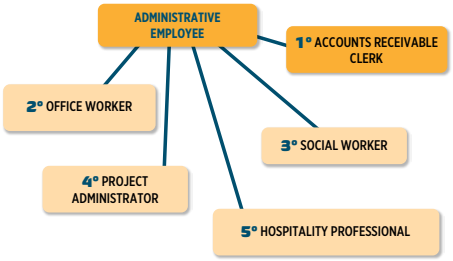
SHARED SKILLS

	ADMINISTRATIVE EMPLOYEE	FINANCE SPECIALIST
Client Billing	92	110
Accounts Payable & Receivable	39	84
Fillers	31	75
Connectivity	9	62
Payroll Administration	19	50
Guides	13	50
Quickbooks	13	49
Charging	33	49
Conferences	50	48
Financial Statement Analysis	13	45

CHILE

ADMINISTRATIVE EMPLOYEE

CLOSEST OCCUPATIONS



SKILLS NEEDED
TO TRANSITION FROM ADMINISTRATIVE EMPLOYEE TO ACCOUNTS RECEIVABLE CLERK

NO ADDITIONAL SKILLS ARE NEEDED TO MAKE THIS TRANSITION

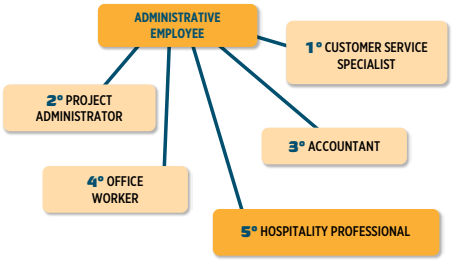
SHARED SKILLS

	ADMINISTRATIVE EMPLOYEE	ACCOUNTS RECEIVABLE CLERK
Administrative Assistance	34	51
Invoicing	28	10
Sap Erp	13	4
Microsoft Outlook	11	9
Purchasing	10	4
Accounting	9	2
Financial Analysis	7	1
Auditing	6	1
Control Theory	6	2
Banking	6	1

MEXICO

ADMINISTRATIVE EMPLOYEE

CLOSEST OCCUPATIONS



SKILLS NEEDED
TO TRANSITION FROM ADMINISTRATIVE EMPLOYEE TO HOSPITALITY PROFESSIONAL

Housekeeping	243
Concierge Services	243
Reservations	239
Guest Service Management	237
Leisure Industry	212
Rooms Division	196
Yield Management	34

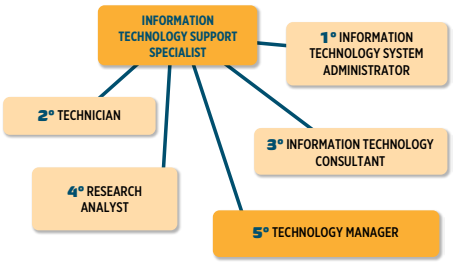
SHARED SKILLS

	ADMINISTRATIVE EMPLOYEE	HOSPITALITY PROFESSIONAL
Hotel Booking	12	220
Receptionist Duties	28	213
Opera	6	199
Micros	3	130
Pre Opening	3	106
Front Office	8	93
Restaurant Management	3	56
Hospitality Management	2	53
Hotel Management	3	47
Hospitality Industry	2	46

ARGENTINA

INFORMATION TECHNOLOGY SUPPORT SPECIALIST

CLOSEST OCCUPATIONS



SKILLS NEEDED TO TRANSITION FROM INFORMATION TECHNOLOGY SUPPORT SPECIALIST TO INFORMATION TECHNOLOGY SYSTEM ADMINISTRATOR

Squid	218
Lan Wan	218
Nagios	175
CentOS	165
Cluster	165
HP UX	164
Cisco IOS	162
Mikrotik	160
Group Policy	159
Asterisk	158

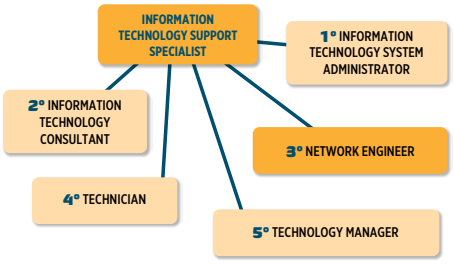
SHARED SKILS

	INFORMATION TECHNOLOGY SUPPORT SPECIALIST	TECHNOLOGY MANAGER
Java Enterprise Edition	14	60
Tomcat	12	58
Spring Framework	12	49
Hibernate	12	48
Active Server Pages (ASP)	26	48
Storage	16	46
Internet Information Services (IIS)	26	40
Disaster Recovery	19	39
Vmware Esx	17	39
Json	12	37

BRAZIL

INFORMATION TECHNOLOGY SUPPORT SPECIALIST

CLOSEST OCCUPATIONS



SKILLS NEEDED TO TRANSITION FROM INFORMATION TECHNOLOGY SUPPORT SPECIALIST TO NETWORK ENGINEER

RIP	262
WLAN	262
LAN Switching	262
Hot Standby Router Protocol (HSRP)	262
MPLS VPN	242
Datacom	234
Cisco Nexus	233
Network Communications	229
Switching	229
Routing Protocols	222

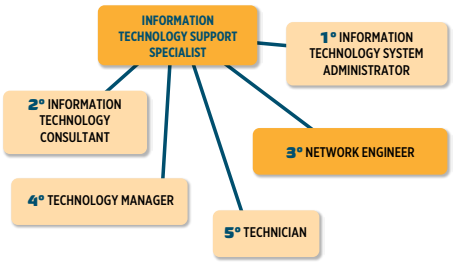
SHARED SKILS

	INFORMATION TECHNOLOGY SUPPORT SPECIALIST	NETWORK ENGINEER
Catalyst Switches	19	243
Cisco Wireless	15	233
EIGRP	11	227
Cisco Networking	24	221
Cisco Certified	10	219
Computer Network Operations	19	210
Cisco VoIP	36	208
Vlan	15	207
Ipv6	13	198
Cisco Call Manager	19	191

MEXICO

INFORMATION TECHNOLOGY SUPPORT SPECIALIST

CLOSEST OCCUPATIONS



SKILLS NEEDED TO TRANSITION FROM INFORMATION TECHNOLOGY SUPPORT SPECIALIST TO NETWORK ENGINEER

Border Gateway Protocol (BGP)	243
VLAN	243
Juniper Networks Products	243
Cisco Nexus	243
EIGRP	243
Routing Protocols	243
Cisco Certified	243
Open Shortest Path First (OSPF)	243
Cisco ASA	243
Core Network	234

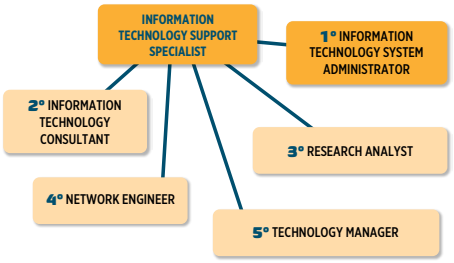
SHARED SKILS

	INFORMATION TECHNOLOGY SUPPORT SPECIALIST	NETWORK ENGINEER
Switching	15	228
Wide Area Network (WAN)	16	210
Cisco Call Manager	25	207
Cisco IOS	23	207
LAN Switching	25	207
Network Engineering	14	207
Multiprotocol Label Switching (MPLS)	10	188
Cisco Routers	22	183
Session Initiation Protocol (SIP)	23	175
Routing	10	162

CHILE

INFORMATION TECHNOLOGY SUPPORT SPECIALIST

CLOSEST OCCUPATIONS



SKILLS NEEDED TO TRANSITION FROM INFORMATION TECHNOLOGY SUPPORT SPECIALIST TO INFORMATION TECHNOLOGY SYSTEM ADMINISTRATOR

Citrix	210
Cisco IOS	210
Fortinet	210
VMware Vsphere	149
VMware ESX	136
Nagios	134
Vmware Infrastructure	128
Hyper V	128
Server Administration	128
Domain Name System (DNS)	119

SHARED SKILS

	INFORMATION TECHNOLOGY SUPPORT SPECIALIST	INFORMATION TECHNOLOGY SYSTEM ADMINISTRATOR
Linux System Administration	39	74
Microsoft Exchange	35	73
Cisco Routers	49	73
Red Hat Linux	25	68
System Administration	33	67
Connectivity	60	66
VMware	26	66
Internet Protocol Suite (TCP/IP)	55	63
Virtualization	22	60
Wireless Networking	68	59

5 | What next?

The information presented in this publication documents the occupations and skills that have increased in demand in Latin America and the Caribbean by combining the strengths of two types of information sources: traditional ones from household surveys carried out in the region and new ones based on anonymized profiles from the LinkedIn social network. Two large groups can be identified: growing occupations and skills associated with the digital economy and growing manual occupations that are not easily automatable and are mostly linked to personal services, including food preparation, beauty services, and cleaning staff.

Some considerations arise simultaneously. **First, measuring the importance of certain 21st-century skills that are growing in demand outside the region remains a pending task in Latin America and the Caribbean.** According to data obtained from LinkedIn profiles from 2015 to 2017, the 20 most in-demand skills are mostly technical; that is, they are skills necessary to perform specific tasks. However, a set of studies highlights the growing importance of social skills that allow people to successfully communicate and interact with others and the importance of critical thinking, creative thinking, and the ability to learn[vi]. Our methodology in this study, based on the skills that LinkedIn users share in their profiles, may generate a bias toward technical or hard skills because those are the ones that people tend to highlight. For a growing number of authors and educators, these soft skills should be at the core of 21st-century trainings because, in combination with specific technical courses, they enable people to adapt in a rapidly changing labor market[vii]. A study conducted in three countries in the region found that these skills were the most valued by employers when hiring[19]. Another recent survey among employers in Peru[20] reveals that, even more than mathematic skills, the most needed skills among personnel are social (teamwork and communication) and critical thinking skills.

A second pending issue is better understanding the causes of the decline in people returning to education and the growing underemployment of people with higher education. This is important because a large proportion of young people in the region aspire to graduate from higher education[21] Perhaps even more importantly, however, is understanding whether these behaviors indicate that countries in the region require less human capital, or, on the contrary, that there is insufficient human capital to support their development models, at least in certain industries and occupations that could grow more[viii].The industries developed in a country are not independent from the human capital on which they rely. Measured by international standards, the region has important structural deficits in its educational systems [22]. The scarcity of relevant human capital could prevent

vi Good examples of this are the publications *The growing importance of social skills in the labor market* (Deming, 2017), *Skill shift: Automation and the future of the workforce* (McKinsey, 2018), and *It's learning. Just not as we know it* (Accenture, 2018).

vii See the studies cited in the previous footnote.

viii Latin America is in a bad balance where the lack of talent prevents it from developing, as expressed by Aedo and Walker in *Skills for the 21st century in Latin America and the Caribbean* (2012).

certain industries that rely heavily on it from advancing. In turn, this would reduce demand for that same human capital. In fact, according to various surveys conducted among entrepreneurs, Latin America is the region with the most difficulty in filling a job vacancy[23].

In fact, the analysis based on LinkedIn profiles suggests a growing demand for digital skills, at least in some segments of the labor market. This requires preparation. Countries in the region cannot overlook these changing demands if they aspire to improve their productivity, enjoy sustained growth, and simultaneously achieve gains in employment quality for the population.

This issue is tied to an urgent need to profoundly modernize education and training systems toward lifelong learning models to provide better services to people by optimizing the use of public resourc-

es and their transparency. Systems are needed to provide people with a solid foundation that enables them to continue learning and to move between jobs or occupations in the event of changes in the labor market. Hence, modern systems are needed to ensure people learn cross-cutting skills from an early age, to encourage people to continue acquiring relevant skills once they are in the labor market, and to provide flexible tools to fill gaps in education.

For training systems to adapt to the labor market's new skill demands, the first step is to make better use of new information sources, like big data, and traditional data sources. This information will enable people to track skill requirements as they change. Thus, it's critical to create a modern information management system that uses all available sources to refine and produce timely information for students, workers, training providers, companies, and policy-makers. Finally, identifying the market's impending needs is necessary to build a system that allows people to access and progress along successful learning and work trajectories by easily transferring between jobs and occupations, acquiring new skills, and deepening existing ones.

In the next issue of this series, we will continue providing new data and evidence regarding:

- how the region's labor market is transforming with the emergence of these new technologies;
- how this impact may differ by gender;
- and how people, companies, and the government can rely on technology to address these challenges.

Identifying the market's impending needs is necessary to build a system that allows people to access and progress along successful learning and work trajectories

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The future of work in Latin America and the Caribbean

OUR NEXT ISSUE

What is the impact of automation on employment?

Do you have any queries, comments, or suggestions?
Contact the editors of this publication at: **factortrabajo@iadb.org**

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